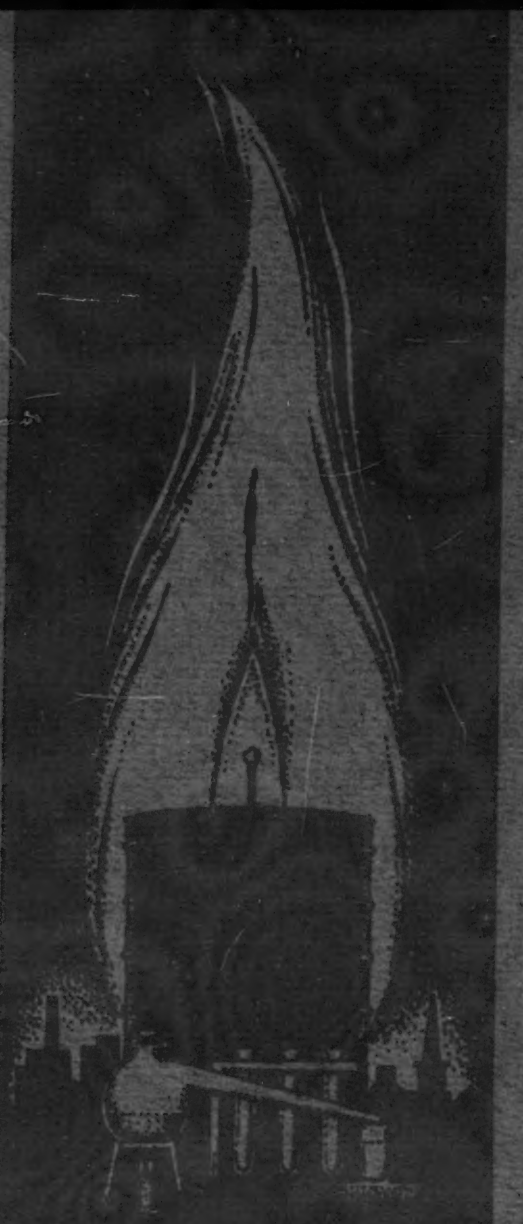

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GAS ABSTRACTS

GAS ABSTRACTS was started in 1945 by the Institute of Gas Technology to survey current technical journals, to select articles pertaining to the Gas Industry, and to prepare abstracts of these articles, stressing their significance to the Gas Industry.

Selection of Articles: Each month the periodicals listed on the last two pages are examined and articles pertaining to the production or manufacture, distribution, transmission or storage, and utilization of natural and manufactured gas and related subjects are selected for abstracting by individual staff members of the Institute of Gas Technology. When possible the significance of the article to the Gas Industry is stressed.

Classification of Abstracts: The abstracts are grouped under twelve headings for presentation and are arranged alphabetically by subject in each group. The headings and subject matter included in each are presented below:

1. The Gas Industry will include general information and news items, statistics, business regulations and other articles of general interest.

2. Appliances - Domestic and Commercial will include burners, ranges, cooking equipment, air conditioning equipment, water heaters and other gas appliances for domestic and commercial use.

3. Combustion and Industrial Furnaces will include combustion of gaseous, liquid and solid fuels; design of industrial furnaces; control of furnace atmospheres.

4. Carbonization and Gasification will include manufacture and purification of producer gas, blue gas, carburetted water gas, synthesis gas; carbonization and gasification of coal; and gasification of oil.

5. Natural Gas and Natural Gas Condensates will include production, transmission, distribution and storage of natural gas and natural gas condensates; distribution of LP-gas mixtures; carbon black and chemicals from natural gas and natural gas condensates.

6. Petroleum and Synthetic Liquid Fuels will include production, refining-cracking, alkylation, isomerization, and utilization of petroleum and production of synthetic liquid fuels by the Fischer-Tropsch reaction and hydrogenation.

7. Analytical Methods and Tests will include new and improved methods pertaining to gas making materials, processes, products, and by-products.

8. General and Physical Chemistry will include data on chemical and physical properties of elements and inorganic compounds; new reactions; and methods for carrying out established reactions.

9. Organic Chemistry will include data on organic compounds closely related to the Gas Industry; new reactions; new methods for carrying out established reactions.

10. Chemical Engineering will include data and methods for fluid flow, heat transfer, and unit operations of distillation, evaporation, extractive drying, and filtration.

11. Process Equipment and Instrumentation will include information on new equipment for process operations and process control.

12. Materials of Construction will include new developments in refractories, heat and corrosion resistant materials, new alloys applicable to the Gas Industry, and other materials of construction.

13. New Books will include recent books pertaining to the field of gas technology.

Annual Index: Author and subject indexes will be issued at the end of the year.

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CONSERVATION AND PRICE OF GAS

Deegan, C.J. PROPER PRICE INCENTIVE WOULD DO MUCH TO FURTHER GAS CONSERVATION. *Oil Gas J.* 44, 56-58 (1946) February 9.

Testifying before the Federal Power Commission Dr. Richard J. Gonzalez, economist for Humble Oil & Refining Co., stated that an increase of 1 cent, or a 40% raise over the average well-head price of gas in 1944, would mean less than 3% higher cost to the ultimate consumers if passed directly on to them. Dr. Gonzalez pointed out that at present well-head prices, the gas revenue from an average oil well in Texas is only about 60 cents per day. This is inadequate to cover the expenses of gathering gas in many small fields and does not offer much incentive to making the necessary initial investment for gas conservation. As gas prices improve, it will become economically feasible to conserve and utilize fully an increasing proportion of the gas produced with the oil.

--L.J. Willien

LP-GAS INDUSTRY

Fisher, F.E. and Valden, J.W. LIQUEFIED PETROLEUM GAS INDUSTRY AND ITS PEACETIME PROBLEMS. *Petroleum Engr.* 17, 116-117 (1946) January.

An analysis of the present position of LPG industry and a forecast of trends for the coming year.

--Author's Abstract

MANUFACTURED GAS INDUSTRY

Miller, B. SYNTHETIC LIQUID FUELS AND THE MANUFACTURED GAS INDUSTRY. *Gas Age* 97, 19-21 (1946) February 21.

The manufactured gas industry, therefore, can consider the prospects for a synthetic liquid fuel industry optimistically. If those prophets who say that petroleum will continue to be abundant for all needs prove to be right, the manufactured gas industry can continue along present lines and increase its use of oil from petroleum as it increases its sales. On the other hand, if it should become necessary to supplement oil from petroleum with synthetic liquid fuels, the manufactured gas industry may find its costs increased but its competitive position in the house-heating field improved because the cost of house-heating oil will probably increase more rapidly than the cost of producing gas. In either case, research and development directed toward economical production of synthetic liquid fuels are almost certain to bring forth improvements which can be applied in the gas industry.

--Author's Abstract

NATURAL GAS INDUSTRY

RECORD NATURAL GAS PRODUCTION. *Oil Weekly* 120, 146-(1946) February 11.

Natural gas production in the United States continued its sharp upward trend during 1945. The volume of marketed production exceeded 3.8 trillion cubic feet, an increase of 65 billion cubic feet over 1944. Marketed production of natural gas has doubled in the last ten years. Consumption of natural gas, according to preliminary figures, rose to 3.84

trillion cubic feet, a gain of 60 billion cubic feet over the preceding year. Industrial use is the largest consumer of natural gas, accounting for almost 3 trillion cubic feet during 1945. Industrial use includes that used in factories, in carbon black plants, for generating electricity, and for oil field purposes. United States' proved reserves of natural gas have been estimated by E. De Golyer, consulting geologist to total more than 140 trillion cubic feet at the beginning of 1945. Later in the year De Golyer declared 200 trillion cubic feet might be a conservative estimate. At the present rate of production, including that flared, the ratio of reserves to present consumption is better than 35 to 1. Of the 140 trillion cubic feet of gas reserves estimated to have existed on January 1, 1945, De Golyer placed 5 trillion cubic feet in the Eastern area, about 17 trillion in Oklahoma and Kansas, over 82 trillion in Texas, 17 trillion in Louisiana, 2¼ trillion in the Rocky Mountain region, and approximately 13 trillion in California.

--Excerpt from Article

NATURAL GAS STORAGE

Sayers, J.B. LEGAL PROBLEMS PRESENTED BY UNDERGROUND STORAGE OF NATURAL GAS. *Gas Age* 97, 21-24 (1946) *February* 7.

An interesting and comprehensive article on the legal problems encountered in the underground storage of natural gas. Specific cases are mentioned and the final decision rendered by the courts are given.

--L.J. Willien

2. APPLIANCES - DOMESTIC AND COMMERCIAL

AIR CONDITIONING

St. Onge, L.R. REDUCING HEAT LOADS IN INDUSTRIAL AIR CONDITIONING. *Refrigerating Engineering* 51, 35-38 (1946) January.

In industrial plants where a great deal of process heat is liberated, a large reduction in the total tonnage of refrigeration required for air conditioning has been made possible by the following means: (1) Placing a ventilating hood with fan exhausting to an outside duct over each high temperature machine or process. (2) Insulating all hot surfaces to reduce radiation and convection heating of the surroundings.

—M.F. Knoy

BAKING

Livett, A.E. BREAD BAKING. *Gas Times* 66, *Supplement* 1 (1946) January 19.

Some interesting background information is given regarding the milling process and the various types of wheat flour produced. Relative merits and costs of coal, coke, oil, gas and electricity for baking are discussed. Oil is considered the most unsatisfactory due to the evolution of undesirable odors.

—M.F. Knoy

BURNERS

G. L.C. RADIANT HEAT BURNER FOR USE ON SOLID TOP RANGES. *Gas Times* 66, 30 (1946) January 19.

A heavy duty burner for closed top commercial ranges is described. It consists essentially of a refractory lined combustion space directly beneath the hot zone of the range top. The top or cap consists of several concentric rings of special cast iron alloy with integralcast fins on the bottom surface for more effective heat transfer.

—M.F. Knoy

BURNERS

Palser, J. THE "C.C" BURNER. *Gas J.* 247, 104-107 (1946) January 16.

A high intensity premix gas burner is described. Pressurized air is used to inspirate gas to produce the combustible mixture. The mixture is discharged through metal nozzles into respective refractory tubes several inches in length. Combustion is completed in the tube at high temperature and at high speed. The resulting high temperature jet of gas may be used for rapid localized heating of any material as desired.

—M.F. Knoy

BURNERS

Waight, J.F. INDUSTRIAL APPLICATIONS OF THE NON-AERATED GAS FLAME. *Gas J.* 246, 765-771 (1945) November 28.

An account is given of the use of neat gas burners for water heaters, boilers, bake ovens, lead pots, and salt baths. One advantage claimed

for the non-aerated burner is that it is less bulky and less expensive than the premix burners, yet it is said to be equal in operating efficiency.

--M.F. Knoy

3. COMBUSTION AND INDUSTRIAL FURNACES

COAL DUST EXPLOSIONS

THE FOREMAN'S FORUM. PERCENTAGES OF METHANE INCREASE DIFFICULTY OF CONTROLLING COAL DUST. *Coal Age* 50, 120-122 *(1945) December.*

Explosions of coal dust may be prevented by the addition of a definite percentage of incombustible rock dust. The percentage of rock dust required to prevent explosion increases rapidly with increase in volatile matter in the coal up to 25% volatile on an ash and moisture-free basis. Between 25% and 40% volatile, a constant percentage of rock dust is required, but above 40% volatile, the rock dust requirements rise again. The presence of 1 or 2% of methane in mine air increases the rock dust requirements, the increase being more marked with low volatile coals.

--M.A. Fisher

DEHYDRATION PLANT

DEHYDRATING APPLE NUGGETS. *Industrial Gas* 24, 15 *(1945) December.*

A brief description of the dehydrating plant of the Naman-Krum Company is given. Natural gas is used in firing two large boilers which furnish the steam for a huge rotary drier and also in firing a third boiler which provides the hot water to heat five vacuum driers. Natural gas is preferred on account of the following advantages: (1) begins to function at top efficiency the instant it is turned on, (2) it is economical, (3) easy to operate and regulate; (4) it is a clean fuel, and (5) it assures the most uniform heat.

--V.S. de Marchi

FLAME HEATING

Henwood, J.B. RAPID FLAME HEATING TECHNIQUES. *Gas* 21, 44-46 *(1945) December.*

Recent developments in the field of industrial heating using new techniques for the combustion of gaseous fuels with air has made possible the economical production of a wide range of parts requiring the application of heat in definite patterns, at definite rates, and to definite temperatures. The combustion system consists of a combustion controller, a fire check, and a burner or system of burners, The burners involved are of two different types; (1) "Superheat burner", or combustion nozzle, is in effect a continuous high temperature internal combustion nozzle which delivers a stream of 3100°F. products of combustion at a theoretical velocity of approximately 1000 ft. per sec.; and (2) radiant burner in which the combustible mixture is admitted radially along the surface of a ceramic cup from an accurately molded ceramic distributor tip located at the center of the base of the cup. The radiant burner can be used for temperatures of 1300 to 3100° F.

--V.S. de Marchi

GAS-FIRED FURNACE

Anderson, R.H., Gunn, D.C., and Roberts, A.L. FURTHER EXPERIENCE FOR THE USE OF PERMEABLE REFRACTORIES IN FURNACE CONSTRUCTION. *Inst. of Fuel War Time Bull. 19-29 (1945) October.*

The authors describe a new type of industrial gas-fired furnace wherein the flue gases are removed by passing outward through all sections of

the furnace lining, which is of porous permeable refractory. A suction is maintained in the space around the furnace lining to facilitate the removal of the flue gas. Advantages claimed for this type of furnace are: (1) More rapid attainment of temperature; (2) Reduced fuel consumption; (3) More even temperature distribution; (4) Higher maximum temperatures.

--M.F. Knoy

4. CARBONIZATION AND GASIFICATION

FOAMED COAL

FOAMED COAL MADE FROM WASTE. *Chem. Eng News* 24, 394 (1946) February 10.

The German invention of "foamed coal", a porous material consisting of coal particles bound together with thermosetting resin, is reported by Allied investigators in Germany to merit further research, with a view to discovery of useful applications of the new material. Its principal characteristics are high reactivity and permeability, resulting from the finely porous and capillary structure of the material. Because of these features, the Germans claim that the fuel would be particularly suitable for use in stationary and vehicular gas producers, in gas engines and rockers, in hydrogenation processes for production of liquid fuels, and in the manufacture of chemical products. However, the investigators comment that no experimental evidence was offered. Small blocks of foamed coal, used in a Zeuch vehicular gas producer, burned at a temperature about 150° C. higher than the usual combustion temperature of similar fuels. As a result, the producer linings burned out, and the inventor had not found time before the end of the war to carry out further experiments to overcome this difficulty.

GAS PURIFICATION

Andrews, R.S. RESEARCH IN THE GAS INDUSTRY: PURIFICATION. *Gas Times* 66, 50-51 (1946) February 2.

The reasons for gas purification are summarized and the economic aspects briefly discussed. Gas distribution problems are outlined along with present methods employed to overcome the difficulties involved and suggestions are made for further research along these lines.

--H. Hakewill

HYDROGEN-CARBON MONOXIDE MIXTURES

Sachsse, E. and Bartholome, E. HYDROGEN-CARBON MONOXIDE MIXTURES. *German Pat. 739,445 Aug. 12, 1943.*

Gaseous hydrocarbons are preheated to approx. 1,000° or higher and are mixed with vapors of the Fe-group metals. The mixture is passed over stationary catalysts and incompletely burned with O in the presence of steam.

--C.A. 39, 5440

WATER GAS MANUFACTURE

Duffield, F.L. PRODUCTION OF WATER GAS. *Brit. Pat. 570,007, Sept. 20, 1943.*

In the production of water gas low in CO and, of necessity, high in CO_2 (eliminated later by scrubbing), the reaction $C + H_2O = CO + H_2$-28900 g. cal. takes place at above 1000° with 99% decomposition of the H_2O, while $C + 2H_2O = CO_2 + 2H_2$-18900 g. cal. occurs at about 600° and only 5% of the H_2O is decomposed. The percent decomposition of H_2O is increased (in the latter reaction) by raising the pressure of operation and superheating the steam so that it supplies nearly all the endothermic heat and the steam flow can continue for a long period. An example of running conditions is: 4 units of steam at 20 atm. and 1160° provide

enough heat to decompose 1 unit of steam at the coke-bed temp. of 760°; the resulting gas comprises H_2 65%, CO 8%, and CO_2 27% and is already at a pressure at which elimination of CO_2 is simple. The coke is raised to the necessary temperature by a producer gas run, and that gas is burned in regenerators which superheat the steam. The excessive superheat at the beginning of a steam flow is reduced by admixture of saturated steam, in reduced proportion as the flow proceeds.

--Brit. Chem. Abs. 1945, B,I, 354

WATER GAS MANUFACTURE

Stookey, K.W. POST-WAR FUTURE OF WATER GAS MANUFACTURE. *Gas Age* 97, 26-27 *(1946) February 7.*

Present methods are appraised and various steps are described whereby capacities of existing equipment can be increased with a minimum of equipment change and investment costs. A study made of oil and its gasification versus the use of solid fuels for making blue gas plus carburetting oil for enrichment, for a large city in the East, shows that, based upon the predicted price for gas oil and Bunker "C" oil in the near future, making a 1000 Btu oil gas could be used to advantage if the gas companies franchise were changed to allow the sale of gas upon a heating value basis. By rebuilding the water gas sets and auxiliary equipment and delivering about a 1000 Btu gas, the fixed charges in plant and distribution equipment would be reduced nearly 50% and with this additional credit, the comparative cost in the holder per MCF of 1000 Btu reformed oil gas would be about 25% less per therm than gas made by the present method of using Bunker "C" oil to enrich blue water gas. Changes to existing water gas sets to make 1000 Btu oil gas and operation of the process are described.

--L.J. Willien

5. NATURAL GAS AND NATURAL GAS CONDENSATES

CHANGE-OVER

Rundorff, R.L. CHANGE-OVER METHODS AND PRACTICES. *Butane-Propane News 8, 92-102 (1946) February.*

The mechanics of changing over a gas distribution system and the appliances it serves to a gas of different heat content is a subject of widespread interest. In this article Mr. Rundorff gives a general description of the policies and methods which his company has adopted in change-over work, including a brief description of the two general methods used, materials and special equipment needed, methods of changing burner port areas, customer surveys, preliminary testing, crew organization and training, and general publicity.

--Editor's Abstract

CYCLING

Hunter, J., Jr. CYCLING. *Natural Gas, Gasoline and Liquefied Petroleum Gases 1, 9-11 (1946) February.*

"Cycling, sometimes referred to as recycling, is the primary Recovery Operation by which 'Condensate' commonly called 'Distillate' is separated or extracted from high pressure gas and the residue gas then compressed and returned to the formation. This method of production is applicable to and necessary in reservoirs where the hydrocarbons present exist in a single vapor phase in order to maintain the resultant loss of liquid hydrocarbons in the reservoir." Gas from "gas-condensate" production is increasing out of all proportion to market demand, hence must either be cycled or blown in air. This condition makes unitizing of cycling operations in such field - on a voluntary basis a necessity if ultimate of conservation, and profit, is to be obtained. This seems, from experiences in some thirty-odd such projects now in operation to be the fairest method yet devised from standpoint of royalty owners and operators, particularly those with minor interests or holdings in the reservoir.

--Excerpt from Article

CYCLING

Hurst, W. and Van Everdingen, A.F. PERFORMANCE OF DISTILLATE RESERVOIRS IN GAS CYCLING. *Petroleum Technology 9, 1-15 (1946) January.*

A distillate-bearing sand complex is often made up of sand stringers of different permeabilities. In order to take into account the influence of the different permeabilities, "parallel flow" is defined, and this concept is used to compute the recovery efficiency of recycling such a sand complex. In the first approximation the position of the wells with respect to one another is not considered. In order to compute the effect on the recovery efficiency of the position of the wells, the area of a field is considered to be made up of rectangles; each rectangle containing one input well in the center and two producers located symmetrically with respect to the input well. Formulas are given from which to obtain the pressure and streamlines in a steady-state flow. A method is devised to compute rapidly the successive positions of the dry gas front. If the field is irregular in shape, pressure and streamlines can be obtained by a potentiometric electrical model study.

By using the concept of "parallel flow" and the results obtained by mathematical analysis or by electrical model study for a homogeneous formation, the effects of different permeabilities and of the location of the wells can be established. From these studies it is apparent that the efficiency of recycling can be profoundly influenced by differences in permeability among the various parallel strata.

--Author's Abstract.

DISTRIBUTION

NATURAL GAS: TO USE OR TO HOLD. *Chemical Industries* 58, 286 (1946) February.

The possibility of disposal of now-surplus Big Inch and Little Inch to gas interests for transporting natural gas raises a basic issue of Federal regulation of natural gas distribution. A recent FPC decision indicates that presence of competing fuels may be a determining factor in deciding what areas will get natural gas service.

--Author's Abstract

LP-GAS - UTILIZATION

Price, D.W. LP-AIR-MANUFACTURED GAS MIXTURE. *Gas Age* 97, 33-34 (1946) February 7. *Amer. Gas J.* 164, 11-13 (1946) February.

The spotlight of interest in the gas industry is focused currently on the use of LP-Gas in its production processes. The opinions and actions may be classified under two heads: pyrolysis with resulting chemical reformation, and mixed or undiluted use of raw material in the gas stream. Data is given on the latter consideration based on practical information gained to date from the initial steps in an actual test and research program designed to establish the limitations which must be recognized to meet service requirements in any application of LP-Gas Mixing. Anyone interested in using LP Gas to supplement manufactured gas should read this article.

NATURAL GAS PRODUCTS

Hohenadel, H.P. PRODUCTS FROM SYNTHESIS OF PETROLEUM AND NATURAL GAS. THE EXPANDING CHEMICAL INDUSTRY OFFERS NEW AND PROFITABLE MARKETS FOR OIL AND GAS PRODUCTS. *Oil Weekly* 120, 27-28 (1946) February 18.

PRODUCTION RATES

Jones, P.J. OPTIMUM RATE OF PRODUCTION FOR UNIFORM PRODUCING AND VARIABLE DEPLETION RATES. *Oil Gas J.* 44, 88-91 (1946) February 9.

Declining rates of production may be accompanied by uniform or variable rates of depletion. A procedure for estimating the optimum rate of production for a reserve, a fraction of which is recoverable before production starts declining and a fraction at uniform rates of depletion, was considered in Part 23 of this series. In the present article, variable rates of depletion are considered. A procedure for estimating optimum rates of production for increasing rates of depletion is illustrated by an example on a natural-gas reservoir having water

encroachment and one on a cycling project. A procedure for estimating optimum rates of production for decreasing rates of depletion is illustrated by examples on oil reservoirs having marginal reserves.

--Author's Abstract

RECOVERY OF CONDENSATES

Foster, A.L. HIGH RECOVERY, SUPERFRACTIONATION MARK SUPERIOR'S LAKE CREEK OPERATIONS. *Oil Gas J.* 44, 50-51, 78-84 (1946) *February 2.*

Designed to process 58 million cu. ft. per day of wet cycle gas of an average C_3's and heavier content of 6.5 gal. per 1000 cu. ft., Superior Oil Co's Lake Creek, Texas, gasoline recovery plant utilizes recovery steps at two different pressure levels, combined with a highly efficient superfractionation system to obtain and purify an imposing list of products. The plant may recover on the average 65,000 gal. per day of propane, 43,000 gal. of isobutane, 65,000 gal. of n-butane, 30,000 gal. of isopentanes, 150,000 gal. of isobutane and isopentane-free natural gasoline, along with 2,500 bbl. per day capacity for stabilized distillate. The Lake Creek cycling plant is very similar in general operation to other modern cycling plants probably for the exception that it embodies several distinctive and proven features which are as follows: Propane refrigeration system; automatic gas injection temperature control; automatic booster compressors; speed and pressure, also packing gland temperature controls; and simplicity and streamlining of plant.

STORAGE

McCullough, G.W., Legatski, H.R. and Pixley, H.J. REDUCING LOSSES OF VOLATILE LIQUIDS IN ATMOSPHERIC PRESSURE STORAGE. *Natl. Petroleum News* 38, 122-130 (1946) *February 6.*

Extensive studies have been made over a period of years by a large oil company of evaporation losses on natural gasoline and other highly volatile products in atmospheric pressure storage. From tests in which temperatures were recorded at various liquid levels as well as in the vapor space at the top of the tank it was shown that evaporation losses are not dependent on average liquid temperature but on the liquid surface level temperature, which may be several degrees higher in the actual installation. Water sprays were used to reduce the vapor temperature and a new type of water spray was devised, similar to the whirling type lawn spray, which was found to have several advantages over other sprays. The advantages of painting tanks white were determined, particularly in connection with the use of a water spray. Other practices followed by this company to reduce evaporation losses from atmospheric pressure tanks includes pumping into tanks at night, when the tanks normally inhale, and pumping out in the daytime, when they normally exhale; tanks are operated in parallel to reduce combined vapor losses.

--Author's Abstract

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

ALKYLATION

Frey, F.E. (to Phillips Petroleum Company). PROCESS FOR REACTING PROPANE WITH OLEFINS. *U.S. 2,391,148 December 18, 1945.*

Propane and ethylene are alkylated in presence of hydrofluoric acid and boron fluoride to produce butanes and higher hydrocarbons. Typical reaction conditions were: 7.4 mole ratio of propane to ethylene, 169° F., 535 psi, 90 minutes reaction time, and catalyst containing 3.8 and 0.1 weight per cent of boron fluoride and water, respectively. Such conditions produced 11.9 weight per cent butanes, and 7.7 pentanes and higher hydrocarbons.

--M. Miyaji

AVIATION GASOLINE, GERMAN

GERMAN WARTIME AVIATION FUELS LARGELY MADE BY HYDROGENATION OF COAL. *Oil Gas J. 44, 92-93 (1946) February 16.*

The paper is taken from Technical Report No. 145-45, "The Manufacture of Aviation Gasoline in Germany" by the U.S. Naval Mission in Europe, July, 1945. In 1943 Germany's highest production of fuel was attained: Motor fuels, 55,000 bbl. per day; aviation fuels, 56,000 bbl. per day. At least 85% of the aviation fuels were made up of base stocks derived directly from coal and coal tar through destructive hydrogenation. A description of the process for aviation fuel base stock is presented. No commercial catalytic cracking was carried out although a process similar to the thermofor process had been developed and was to be installed for cracking gas oils. This process was not believed applicable to coal tars because of high coke deposit on the catalyst. About 4700 bbl. per day of synthetic isoparaffins were manufactured by the Germans. One method involved production of isobutyl alcohol by a variation of the Fischer-Tropsch process. This product was dehydrated, polymerized and hydrogenated to produce isooctane. A second method involved dehydrogenation of normal or isobutane and alkylation with isobutane in the presence of sulfuric acid catalyst. A product called,"Peroptan", was produced by the reaction of one part of chloropropane with five parts of isobutane in the presence of one part of aluminum chloride at 32° F. A major part of the product was 2,2,3-trimethylpentane and an over-all yield of 80% was obtained. This development was never placed on a large scale basis. Four normal butane isomerization units of the vapor-phase type were operating in Germany. Pentane, hexane, heptane and cyclohexane were isomerized in laboratory investigation by the K.W. Institute. The Germans made two grades of fuel both containing 4.35 cc of tetraethyl lead per gallon. The B-4 or blue grade was a fraction from coal tar hydrogenation, 89 motor method octane. The C-3 or Green grade contained 10-15% of synthetic isoparaffins, and 85% of aromatized base stock produced by hydroforming; octane rating was 95. While Germans aviation fuel was poor in lean-mixture performance, its quality approached that of the United Nations.

--C.H. Riesz

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

CATALYSTS, AROMATIZATION

Fisher, F.E., Watts, H.C., Harris, G.E. and Hollenbeck, C.M. CATALYTIC CONVERSION OF HYDROCARBONS. *Ind. Eng. Chem.* 38, 61-64 (1946) January.

The activity of the catalyst in the catalytic aromatization of aliphatic hydrocarbons was improved to an appreciable extent by the addition of antimony tetroxide to the chromia-alumina catalyst. The aromatization reaction was carried out on three different types of charge stocks: a heptane fraction from a natural gasoline, a heavy straight-run gasoline, and a thermally cracked gasoline. Both the liquid and gaseous products were analyzed. The production of aromatics during any one reaction period increased through a maximum and then decreased. The yield of gaseous products paralleled the formation of aromatics until excessive cracking superseded the dehydrogenation-cyclization reaction.

--Author's Abstract

DIESEL FUELS, GERMAN

Bender, R.J. GERMAN WARTIME DIESEL FUELS WERE BLENDS OF NATURAL AND SYNTHETIC PRODUCTS. *Natl. Petroleum News* 38, 104-105 (1946) February 6.

The Germans obtained their diesel fuel from the following principal sources: (a) Fractions from refining of crude petroleum oil were employed as received and in blends. (b) Kogasin II, obtained from the Fischer-Tropsch synthesis, had a cetane value of 90-100. Used in this form, it had no advantage over regular diesel oil of about 147 cetane value. When it is blended in 40-60 proportion with petroleum or coal tar oils, it produces a suitable diesel oil. However, the mixture must usually be refined with sulfur dioxide to precipitate out heavy tar, asphalt and carbon (10% by weight total) which would otherwise clog injection nozzles in high speed engines. (c) Kogasin I, a lighter fraction from the Fischer-Tropsch process, had a 35-60 cetane number. (d) Distillates from low-temperature carbonization of coal and lignite were poor diesel fuels. (e) Distillates from coal hydrogenation were satisfactory especially when blended with Kogasin II. (f) Shale oil was usable for diesel oil after treatment.

--C.H. Riesz

DIISOPROPYL ALKYLATE

Alden, R.C., Frey, F.E., Hepp, H.T. and McReynolds, L.A. THE STORY OF DIISOPROPYL. *Oil Gas J.* 44, 70-73 (1946) February 9.

Diisopropyl alkylate containing about 65% of diisopropyl is being manufactured on a commercial scale by Phillips Petroleum Co. at the Phillips, Tex. plant by alkylating an ethylene-propylene mixture against isobutane in the presence of an aluminum chloride catalyst. The raw materials for the process are ethane, propane, and n-butane. Diisopropyl alkylate may be employed either in motor fuel or in aviation gasoline. Its high knock rating both under normal cruising and supercharged rich-mixture conditions makes it particularly valuable as a blending agent in the manufacture of high quality aviation gasoline.

--Author's Abstract

FISCHER-TROPSCH PLANT

Horne, W.A. and Jones, J.P. FISCHER-TROPSCH UNIT AT LEIPZIG GAS WORKS. *Gas Age 97, 28 (1946) February 7.*

The material is taken from Report No. 294 of the Office of Publication Board. The plant was inspected by the authors in May, 1945. The Fischer-Tropsch plant was to be installed for the enrichment of Leipzig city gas as well as for liquid and solid hydrocarbon (wax) production. It was the smallest considered economically operable for this purpose, and was 75% complete at the time of allied occupation. The plant is low-pressure plant of conventional German design for operation at 365 to 392° F. About 725 tons per month of gasoline, medium oil and wax was expected of which the liquid product estimated at about 500 tons (110 bbl/day) was to be shipped to Leuna or Lutzkendorf for further processing. Coke oven gas and water gas were mixed, purified by means of activated carbon, freed from sulfur by iron oxide at 492-572° F before passage to the synthesis chambers. These consisted of 4 units of 3 reactors per unit. Each reactor was 16 ft. long; 6 ft. wide and 9 ft. high and contained 350 cu. ft. of standard cobalt catalyst (apparent space velocity, 75 cu. ft./cu. ft. catalyst). After cooling in a water wash tower, water was separated from oil by gravity and residual gases were scrubbed with activated carbon for recovery of propane and butane. The residual gas was blended with coke oven gas and water gas to make town gas for the city of Leipzig. The quantities and composition of the various gases are shown below.

	Coke Oven Gas	Water Gas	Synthesis Gas	Residual Gas	City Gas Blend
Coke oven gas, Mcf/day			2600		3200
Water gas, Mcf/day			5200		3000
Residual gas, Mcf/day					3900
Mcf of gas/day	5800	8100	7800	3900	10,100
Analysis					
CO_2	2.4	5.0	4.1	8.1	5.4
Ill.	1.2	-	0.4	1.0	0.8
O_2	0.4	-	0.1	-	0.1
CO	5.7	38.0	27.2	21.3	21.2
H_2	59.0	52.0	54.3	37.5	48.6
CH_4	27.8	0.3	9.6	23.6	18.1
N_2	3.5	4.7	4.3	8.5	5.8
Btu/cu.ft.	-	-	-	-	440

Abstracters Note: Since measurement conditions were not stated, calculated English unit data in abstract is only approximate.

--C.H. Riesz

HYDROGENATION

Greensfelder, B.S. and Bailey, W.A. (to Shell Development Co.) CATALYTIC TREATMENT OF CARBONACEOUS MATERIALS. *U.S. 2,392,588 January 8, 1946.*

Lower boiling hydrocarbons are produced from higher boiling carbonaceous materials, such as a paste of coal and heavy oil, by contacting them with an excess of hydrogen under pressure of at least 200 atmospheres at 200-600° C. in the presence of a catalyst containing less than 20% silica

comprising alumina and boric oxide in which the boric oxide content is 6-30% of the total weight of alumina and boric oxide, the catalyst having a specific surface of 100 sq. m. per gram and a bulk density between 0.4 and 1.0.

ISOMERIZATION

Finger, J.S. FUNDAMENTALS OF ISOMERIZATION. *Petroleum Refiner* 25, 105-110 *(1946) January.*

Isomerization of normal butane, normal pentane and light naphthas is briefly discussed. Most of the commercial units isomerize normal butane; less than ten units are for pentane and naphtha isomerization. The process is either vapor phase, liquid phase or mixed phase depending upon the temperature, pressure and feed. Aluminum chloride plus hydrogen chloride is universally used to catalyze the reaction.

--C.H. Riesz

PETROLEUM REFINING

Cannon, C.W. REFRIGERATION APPLICATIONS IN PETROLEUM PROCESSING. *Refrigerating Eng.* 51, 130-134 *(1946) January.*

The author describes in detail three important uses of refrigeration in refinery processes. The three are: To reduce vapor pressure of volatile components; to affect solubility relationships, and to secure selective chemical reactions.

REFINING

Terres, E. THE USE OF SELECTIVE SOLVENTS TO EXTRACT FRACTIONS FROM SYNTHETIC OIL FROM COAL. *Natl. Petroleum News* 38, 84-88 *(1946) February 6.*

This is the first of four articles concerning developments of the Edeleanu Company in Germany and is abstracted from an official C.I.O.S. report on this company and the A.G. Sachelschewerke at Espenhain. This first article is an abridged translation by J.P. Jones, member of the U.S. Technical Oil Mission, of a confidential report prepared by Ernest Terres, manager of Edeleanu. After a short review of solvent extraction and refining of various oils and tars, the use of triangular coordinate graphs in solvent process is discussed. Emphasis is placed on the use of liquid sulfur dioxide for the treatment of tar from low-temperature carbonization (L.T.C.) of brown coal. Schematic flow diagrams are presented separating petroleum oil, shale oil and L.T.C. brown coal into fractions such as: gasoline, heating oil, diesel oil, soft wax, hard wax, lubricating oils, asphaltand coke.

--C.H. Riesz

SYNTHETIC LUBRICANTS

Kratzer, J.C., Green D.H. and Williams, D.B. NEW SYNTHETIC LUBRICANTS. *Petroleum Refiner* 25, 79-90 *(1946) February; Natl Petroleum News* 38, 135-146 *(1946) February 6.*

The purpose of this paper is to describe in some detail the characteristics of two series of synthetic lubricants having certain

unusual properties. Until recently these compounds were subject to an order of secrecy issued by the Commissioner of Patents. Both series of lubricants are currently being produced on a commercial scale by Carbide and Carbon Chemicals Corporation. One series of synthetic lubricants, which is essentially insoluble in water, is designated by the symbol "LB" followed by a number representing the viscosity at 100° F. in Saybolt Universal Seconds. The other series, the members of which are soluble in water at room temperature, is designated by the symbol "50-HB" similarly followed by a number designating the Saybolt viscosity at 100° F. These synthetic lubricants were developed by units of Union Carbide and Carbon Corporation. The new synthetic lubricants to be described here are synthesized from natural or other hydrocarbon gases as raw materials. They contain no petroleum oils. They are inherently more expensive to produce than the best petroleum lubricants now sold. This factor will probably limit the market for these products except where their special properties justify increased cost. Both the LB series (water-insoluble) and the 50-HB series (water-soluble) of synthetic lubricants are being manufactured and sold by Carbide and Carbon Chemicals Corporation under the trade mark "Ucon" for a wide variety of industrial applications.

--Excerpt from Article

7. ANALYTICAL METHODS AND TESTS

HYDROCARBON IDENTIFICATION BY OPTICAL PROPERTIES

Wendland, R.T. A SYSTEM OF CHARACTERIZATION OF PURE HYDROCARBONS. *J. Chem. Education* 23, 3-21 (1946) *January*.

Chemical differences among the various types of hydrocarbons are rarely suitable for employment in a system for identification of compounds based on simple characteristic reactions and the preparation of derivatives. The fact of the extraordinary variety of chemical reactivities exhibited by the hydrocarbons complicates the problem of an easy differentiation of classes based on generic chemical tests. Extensive examination of the physical properties of hydrocarbons, particularly of the optical properties, reveals the basis for methods of characterization adequate for segregating numerous classes and subgroups of compounds. The employment of simple chemical tests and a system of limiting values for the common physical properties served to place an unknown compound in a well-defined subgroup of compounds. The optical property, specific dispersion, has been found to be most characteristic of structural differences in hydrocarbons involving the question of saturation, presence of carbon-carbon double bonds and conjugation thereof, or presence of aromatic rings. As such, dispersion values have been used extensively in the system of characterization described for the investigation of unknown hydrocarbons.

--Author's Abstract

8. GENERAL AND PHYSICAL CHEMISTRY

NITRIC OXIDE MANUFACTURE

NEW THERMAL PROCESS FOR NO. *Chemical Industries* 48, 245 *(1945) February.*

A process developed at the University of Wisconsin involves the direct combination of nitrogen and oxygen, using ordinary air as raw material, to form nitric oxide. In the process the inlet air is preheated to a very high temperature by passing through a hot bed of refractory pebbles into a large furnace where combustion of the fuel gas, injected at this point, raises the gas temperature to the reaction temperature, 4200° F. The resultant hot mixture, consisting of the products of combustion, excess air and nitric oxide must then be cooled to below 2800° F. in less than 0.1 sec. to obtain high nitric oxide recoveries. This cooling is carried out by passing the hot gases through another bed of refractory pebbles like those used for preheating the air. The final temperature of the gases leaving the cooling bed varies from 300-500° F. The concentration of nitric oxide in the off-gas is reported to be 1.75%.

--Excerpt from Article

SULFUR PRODUCTION

Jones, M.C.K. (to Standard Oil Development Co.). PROCESS FOR PRODUCING SULPHUR. *U.S. 2,384,026 September 18, 1945.*

Hydrogen sulphide-bearing gases are disposed by reacting them with sulphur dioxide at about 896° F in the presence of a "fluid" catalyst prepared by activating silica gel with oxides of boron, sodium and potassium. The elemental sulphur is condensed and withdrawn as a liquid. 10 process claims.

--A.J. Rudnitzki

SULFUR - VISCOSITY

Fanelli, R. MODIFYING THE VISCOSITY OF SULFUR. *Ind. Eng. Chem.* 38, *39-43 (1946) January.*

The manifold uses of sulfur undoubtedly would be augmented if its viscosity at elevated temperatures could be modified. Experiments conducted with open and closed systems indicate that the viscosity of sulfur can be modified and controlled by the additions of halogens, hydrogen sulfide, and hydrogen persulfide. By this means it is possible to produce mixtures having a constant viscosity at temperatures above 160°.C.

--Author's Abstract

SULFUR DIOXIDE

Grummitt, O. and Ardis, A. REACTIONS OF SULFUR DIOXIDE WITH UNSATURATED HYDROCARBONS. *J. Chem. Education* 23, *73-77 (1946) February.*

Sulfur dioxide reacts with unsaturated hydrocarbons and their derivatives to form thermoplastic, resinous polysulfones. The reaction conditions for this polymerization, the structure, physical and chemical properties of the polysulfones have been described. With conjugated diolefins sulfur dioxide adds to form unsaturated cyclic sulfones in a reaction comparable in several respects to the Diels-Alder reaction. This

addition is reversible and it is therefore useful in separating hydrocarbon mixtures and in purifying diolefins. The cyclic sulfones are reactive compounds useful for the preparation of solvents and many other derivatives. Neither the polysulfones nor the cyclic sulfones appear to have found any large practical application, but both substances offer excellent possibilities.

--Author's Abstract

9. ORGANIC CHEMISTRY

ALKYLATION

Egloff, G. and Hulla, G. THE ALKYLATION OF ALKANES. *Chem. Reviews* 37, 323-397 *(1945) December.*

The present review considers the available literature, exclusive of patents, on the alkylation of alkanes. Seven alkylations with three normal alkanes (propane, butane, and hexane) and fifty alkylations with three branched-chain alkanes (isobutane, isopentane, and 2,2,4-trimethylpentane) are discussed. Of these fifty seven alkylations, seven use aluminum chloride; four use aluminum chloride plus alkali chloride; four use aluminum bromide; one uses aluminum bromide plus aluminum chloride; one uses zirconium chloride; six use boron fluoride; eight use hydrogen fluoride; twenty use sulfuric acid; and one uses phosphoric acid as catalyst. Five alkylations are thermal reactions. Isobutane has been alkylated by fifteen alkenes, one alkadiene, four alkylhalides, one dialkyl sulfate, and two alkenyl chlorides. Isobutane reacts with ethene to yield mainly 2,2- dimethylbutane (thermally) or 2, 3 dimethylbutane (catalytically, except in the presence of sulfuric acid.). Mechanisms of alkylation proposed by eight groups of investigators are presented.

--Excerpt from Article

BUTADIENE, THERMODYNAMIC PROPERTIES

Aston, J.G. and Szasz, G. THERMODYNAMIC PROPERTIES OF GASEOUS 1, 3-BUTADIENE AND THE NORMAL BUTENES ABOVE 25° C. *J. Chem. Physics* 14, 67-79 *(1946) February.*

Tables of the thermodynamic functions C_p°, H°, S°, and F° are given for 1,3-butadiene and the normal butenes for temperatures from 298.16° K to 1500° K for the substances in the ideal gas states at one atmosphere pressure. These have been prepared using reliable spectroscopic and molecular data, together with calorimetric entropies, gaseous specific heats, and heats of formation. Equilibrium constants are given for reactions in the system 1,3-butadiene, n-butenes, and n-butane. Available experimental data are compared with the calculations. The calorimetric data for 1,3-butadiene furnish strong evidence for the existence of two geometric (cis-trans) isomeric forms of 1,3-butadiene in appreciable concentrations at room temperatures. The two forms differ in energy by 2.3 kcal. $mole^{-1}$, and are separated by a C - C rotational barrier 2.6 kcal. $mole^{-1}$ above the lowest energy level of the cis, or higher, energy form.

--Author's Abstract

CATALYSTS, FRIEDEL-CRAFTS

Sachanen, A.N. and Caesar, P.D. NEW CATALYSTS FOR FRIEDEL-CRAFTS TYPE REACTIONS. *Ind. Eng. Chem.* 38, 43-45 *(1946) January.*

Various typical reactions, catalyzed by Friedel-Crafts catalysts or strong acids, may be carried out in the presence of heterogeneous catalysts of the silica-alumina type or homogeneous catalysts such as hydrogen halides

or organic halides. The syntheses of anthraquinone and benzophenone are described as new examples of the application of such catalysts to conventional reactions of the Friedel-Crafts type.

--Author's Abstract

HYDROCARBONS, VAPOR PRESSURE

Willingham, C.B., Taylor, W.L., Pignocco, J.M. and Rossini, F.D. VAPOR PRESSURES AND BOILING POINTS OF SOME PARAFFIN, ALKYLCYCLOPENTANE, ALKYLCYCLOHEXANE, AND ALKYLBENZENE HYDROCARBONS. *J. Research Natl. Bureau of Standards.* 3, 219-228 *(1945) September.*

Measurements of vapor pressures and boiling points, over the range 47 to 780 mm. mercury and above about 12° C, were made on 52 purified hydrocarbons. The apparatus consisted of an electrically heated boiler, a vapor space with a vertical reentrant tube containing a platinum thermometer having a resistance of 25 ohms, and a condenser. Measurements of the temperature of the liquid-vapor equilibrium were made at 20 fixed pressures maintained automatically. The values of the fixed pressures were determined by calibration of the apparatus with water by using the vapor pressure-temperature tables prepared at the National Bureau of Standards. The experimental data on the hydrocarbons were correlated, the method of least squares being used, with the three-constant Antoine equation for vapor pressures, $\log P = A - B/(C + t)$ or $t = B/(A - \log P) - C$. Experimental data, together with the values of the three constants of the Abtoine equation, applicable over the range of measurement, are reported for 30 paraffin, 4 alkylcyclopentane, 10 alkylcyclohexane, and 8 alkylbenzene hydrocarbons.

--Author's Abstract

PROPANE, THERMODYNAMIC PROPERTIES

THERMODYNAMIC PROPERTIES OF PROPANE AND BUTANE. *Oil Gas J.* 44, 89-90. *(1946) February 2.*

Data which have been published previously are presented in table form. Pressure in lb. per sq. in., specific volume in cu. ft. per lb., density in lb. per cu. ft., enthalpy in Btu per lb., latent heat in Btu per lb. and entropy in Btu per lb. per °F. for temperatures from 0 to 100° F in 5° intervals are given for propane and butane.

PROPYLENE REACTIONS

Gunning, H.E. and Steacie, E.W.R. THE MERCURY PHOTOSENSITIZED REACTIONS OF PROPYLENE AND ISOPRENE. *J. Chem. Physics* 14, 57-61 *(1946) February.*

An investigation has been made of the reactions of propylene and isoprene with mercury ($^3P_1$) atoms, at 30° C, in a static system. The reactions are similar in that the rates of consumption of both propylene and isoprene decrease with increasing pressure in the range of complete quenching. In addition, the quantum yields of both reactions are low. The products of the propylene reaction are liquid polymer and hydrogen, together with smaller amounts of methane, ethylene, and hexene. The principal steps in the mechanism proposed for the propylene reaction are

$C_3H_6 + Hg\ (^3P_1) \rightarrow C_3H_6 + Hg\ (^1S_0)$; $C_3H_6 + C_3H_6 \rightarrow 2C_3H_6$; $C_3H_6 \rightarrow C_3H_5 + H$; $H + C_3H_6 \rightarrow C_3H_5 + H_2$; $H + C_3H_6 \rightarrow CH_3 + C_2H_4$; followed by polymerization reactions of the type $C_3H_5 + C_3H_6 \rightarrow C_6H_{11}$, etc.

--Author's Abstract

VAPOR-LIQUID EQUILIBRIA

Harrison, J.M. and Berg, L. VAPOR-LIQUID EQUILIBRIA OF BINARY HYDROCARBON SYSTEMS. *Ind. Eng. Chem.* 38, 117-120 (1946) January.

A number of close-boiling binary hydrocarbon systems has been investigated. Minimum azeotropes exist between 2,2,3-trimethylbutane-benzene, boiling at 75.6° C. at 736 mm. and containing 56.7 mole % benzene; between 2,2,3-trimethylbutane-cyclohexane, boiling at 79.45° C. at 744 mm. and containing 47.8 mole % 2,2,3-trimethylbutane; and between benzene-cyclohexene boiling at 78.9° C. at 740 mm. and containing 65.7 mole % benzene. No azeotrope was found in the systems 2,2,4-trimethyl-pentane-methylcyclohexane and cyclohexane-cyclohexene.

--Author's Abstract

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--Author's Abstract

10. CHEMICAL ENGINEERING

ABSORPTION

Carlson, H.C. ABSORPTION AND HUMIDIFICATION. *Ind. Eng. Chem.* 38, 14-15 *(1946) January.*

Articles appearing in this field from October 1943 to November 1945 are briefly reviewed. Work of particular interest to the gas industry is as follows: (1) Goff and Gratch-Heating, Piping and Air Conditioning 17, 334 (1945). The thermodynamic properties of air, water and their mixtures are treated. (2) Walthall, Miller and Striplin- Trans. Amer. Inst. Chem. Engr. 41, 53 (1945) relate studies on the absorption of SO_2 and O_2 in water containing additional agents to form H_2SO_4. (3) Articles on drying natural gas by diethylene glycol by Hull and by Russell. (4) Articles on absorption of CO_2 are listed.

--J.D. Parent

DISTILLATION

Walsh, T.J. HIGH TEMPERATURE DISTILLATION. *Ind. Eng. Chem.* 38, 8-9 *(1946) January.*

Improved columns for analytical distillation are mentioned. Some are automatic and have a very small hold-up, but require a long time for the completion of an analysis. It has been found that there is a physico-chemically optimum pressure for distillation. Thus, an increase in pressure means a greater vapor capacity, but a lower relative volatility. Extractive distillation has come into wide usage for the separation of components of about the same volatility. The added component has the lowest volatility and is added near the top. It is easily fractionated out of the overhead vapor. By forming a non-ideal solution, the relative volatility of the original constituents is increased.

--J.D. Parent

EXTRACTIVE DISTILLATION

Griswold, J., Andres, D., Van Berg, C.F., and Kasch, J.E. PURE HYDROCARBONS FROM PETROLEUM. *Ind. Eng. Chem.* 38, 65-70. *(1946) January.*

The Distex process is described with its application to the separation of straight-run fractions consisting of paraffins, naphthenes, and aromatics. Details are given of the apparatus and procedures used to resolve the narrow-boiling hexane fraction reported. This type of operation has been designated "extractive distillation" where applied to toluene purification, and lately to butadiene purification. The authors' term "Distex" has been used for a number of years to designate the same type of operation for separations in general, such as paraffin-naphthene.

--Author's Abstract

10. CHEMICAL ENGINEERING

HEAT TRANSFER

Fishenden, M. and Saunders, O.A. SOME SIMPLIFIED HEAT TRANSFER DATA. *J. Inst. Fuel* 19, 62-71 *(1946) January.*

Heat transfer theory and data for convection and radiation are briefly presented in a very easily understood form. Gas radiation and convection in tube banks receive special attention.

--J.D. Parent

HEAT TRANSFER

Skaperdas, G.T. HEAT TRANSFER. *Ind. Eng. Chem.* 38, 10-11 *(1946) January.*

Papers which have appeared in the last two years on heat transfer are mentioned. Contributions have been made in the fields of extended surfaces (fins), agitated vessels, mathematical solutions of complex problems, heat transfer coefficients for condensing films, heat transfer media and mechanical design. No data are given, but an extensive bibliography is appended to the article. A novel scheme reported is that of Danforth (U.S. Patent 2,333,845) who used nitrogen dioxide to absorb heat in one zone by decomposition and to liberate heat by recombination in another.

--J.D. Parent

SOLVENT EXTRACTION

Elgin, J.C. SOLVENT EXTRACTION. *Ind. Eng. Chem.* 38, 26-27 *(1946) January.*

This is an article on recent advances in solvent extraction. Advances of importance are: extractive distillation, which is a combination of extraction with ordinary distillation and theoretical studies. The latter includes phase equilibrium data, correlations of equilibrium data, equipment studies and mass transfer rate studies. Of particular importance is the success of several investigators in separating the overall mass transfer coefficient into individual film coefficients. A bibliography of 48 articles is appended.

--J.D. Parent

SUPER-EXPANSIBILITY

Clinedinst, W.O. SUPER-EXPANSIBILITY OF METHANE-ETHANE MIXTURES. *Oil Weekly* 120, 46-47 *(1946) January 28.*

The author presents curves whereby the Weymouth equation for flow of gas in a pipe line can be corrected for super-expansibility. The data are for mixtures of CH_4 and C_2H_6. Abstractor's note: Super-expansibility is the reciprocal of super-compressibility, which is also known as the compressibility factor. Thus, in place of the ideal gas law one may write for actual gases: $PV = ZnRT = \frac{nRT}{Y}$ where P = absolute pressure, T = absolute temperature, V = gas volume, Y

n = No. of mols of gas, R = universal gas constant, Z = compressibility factor, Y = super-expansibility.

--J.D. Parent

VISCOSITY CORRELATION

Othmer, D.F. and Josefowitz, S. CORRELATING VISCOSITIES OF GASES WITH TEMPERATURE AND PRESSURE. *Ind. Eng. Chem.* 38, 111-116 (1946) January.

At constant pressure, viscosities of gases and of gaseous mixtures may be plotted directly to give straight lines on logarithmic paper against a temperature scale calibrated from the vapor pressure of a reference liquid. At constant temperature, gas viscosities may be plotted to give straight lines on logarithmic paper against the ratio of the kinematic pressure and the gas density. Methods of correlating gas viscosities, temperatures, and pressures are expanded to allow the estimation of the viscosity of gases under different conditions where their PVT data and the viscosity at one set of conditions are known. A nomograph has been constructed to allow ready determination of viscosities; it is believed that values so determined fall well within the precision of published experimental data. Thermodynamic derivations indicate the theoretical basis of these plots and the resulting nomograph.

--Author's Abstract

II. PROCESS EQUIPMENT AND INSTRUMENTATION

BUBBLE TRAYS

NEW DESIGN OF DOWNSPOUT FOR BUBBLE TRAYS SEPARATES LIQUID FROM FOAM AND VAPORS. *Natl. Petroleum News* 37, R-990 (1945) December 5.

The innovation of the design, patented by C.G. Gerhold of U.O.P. (U.S. 2,385,355), consists of withdrawing liquid from the bottom portion of the liquid on the tray as well as at the surface through an annular downspout. The desired liquid level on the tray is maintained between two fairly close limits by making the lower downspout ports too small to handle all the overflow at the normal head of liquid on the tray. In operation, the liquid level rises on the tray to the height of the upper ports, filling the downspout with liquid down to where the center pipe ends, thus creating a much bigger head on the lower ports and the resulting accelerated flow drops the liquid level to the lower limit. (The center pipe is shorter than the outer one in which it is placed.) The advantages of withdrawing liquid from the bottom are avoidance of carrying down entrained vapors and foam with the resulting possibility of using smaller downcomers, thereby providing more efficient utilization of bubble tray area with a possible use of smaller diameter towers and the elimination of the possibility of accumulating sediment on the individual trays.

--J.J. First

FLOCCULATION EQUIPMENT

Kite, R.P. and Fischer, A.J. SEDIMENTATION AND HYDRAULIC CLASSIFICATION. *Ind. Eng. Chem.* 38, 16-17 (1946) January.

According to the authors the most significant of the recent advances in this field are mechanical conditioning of flocculation of the feed prior to sedimentation and improvements in design. Several pieces of equipment are discussed briefly, namely, the clariflocculator, the multifeed clarifier and the continuous pressure separator used in connection with the fluidized process or catalytic cracking. Apparatus improvements in several fields such as the metallurgical industry are noted.

--J.D. Parent

RADIADION PYROMETER

Vollrath, J.P. THE MEASUREMENT OF FLAME RADIATING CHARACTERISTICS. *Gas* 22, 42-44 (1946) February.

The Brown system of flame character measuring equipment consists of: (1) The Radiamatic and suitable accessories to adapt it to the application. (2) The Electronic recording instrument. The Radiamatic is an industrial type radiation pyrometer having laboratory accuracy. For this service it is supplied with a fused silica lens and is known as the "intermediate range radiamatic." It has many operating features which combine to make it the ideal tool for this application. These features include: (1) Ambient temperature compensation. (2) Suitable for all fuels. (3) High Speed of Response. (4) May be operated at High Ambient. (5) Rugged Construction. (6) Interchangeable Calibration.

--Excerpt from Article

12. MATERIALS OF CONSTRUCTION

ALLOY

Fleischmann, M. 16-25-6 ALLOY FOR GAS TURBINES. *Iron Age* 157, *44-53 January 17; and 50-60 (1946) January 24.*

A new alloy has been developed for gas turbine and turbo supercharger applications by the Timken Roller Bearing Company. The alloy contains 16% Cr sufficient to assure the required corrosion and oxidation resistance, 6% Mo to contribute to the high temperature strength, and 26% Ni is introduced to assure a purely austenitic steel, free from delta iron. A low carbon (0.12% max.) is desirable in order to assure good forging and welding qualities. This alloy is non magnetic and it has a high creep resistance at elevated temperatures. Comparisons with other austenitic and pearlitic steels are included.

--V.S. de Marchi

CORROSION PREVENTION

Menaul, P.L. and Dunn, T.H. FORMALDEHYDE AS AN INHIBITOR OF CORROSION CAUSED BY HYDROGEN SULPHIDE. *Petroleum Technology* 9, *1-8 (1946) January.*

This paper discusses the results of an investigation made to develop a method of combatting corrosion of subsurface oil-well equipment caused by brines containing hydrogen sulphide. Carbon monoxide, aldehydes, and certain cyanide compounds were found by laboratory tests to effectively inhibit corrosion of steel by sulphide brines. Experiments were made for one year in eight wells in West Texas fields using formaldehyde as an inhibitor. It was found that the inhibitor treatment successfully prevented the severe corrosion previously experienced in these wells, and effected important net savings in operating costs.

--Author's Abstract

INSULATING MATERIALS

Horrell, R.F. SILICONE RESINS RAISE INSULATION OPERATING TEMPERATURE LIMITS. *Petroleum Engr.* 17, *204-214 (1945) November.*

By using such inorganic insulating materials as glass, asbestos, and mica with a binder of silicone resin it is possible to increase the maximum operating temperature of electric motors to around 200° C. This permits a substantial decrease in weight and bulk per rated horsepower and is a great advantage in many applications.

—M.F. Knoy

13. NEW BOOKS

Skrotzki, B.G.A. and Vopat, W.A. APPLIED ENERGY CONVERSION. *New York, McGraw-Hill Book Co., 1945.*

A text in power plant engineering.

PERIODICALS ABSTRACTED FOR GAS ABSTRACTS

AMERICAN ASSOCIATION FOR ADVANCEMENT OF SCIENCE BULLETIN

AMERICAN GAS ASSOCIATION MONTHLY

AMERICAN GAS JOURNAL

AMERICAN PETROLEUM INSTITUTE QUARTERLY

AMERICAN SOCIETY FOR TESTING MATERIALS BULLETIN

AMERICAN SCIENTIST

ARCHITECTURAL FORUM

BERICHTE DER DEUTSCHEN CHEMISCHEN GESELLSCHAFT

BITUMINOUS COAL RESEARCH

BLAST FURNACE AND STEEL PLANT

BRAUNKOHLE *(Microfilm)*

BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS: SECTIONS A AND B.

BRITISH COAL UTILISATION RESEARCH ASSOCIATION MONTHLY BULLETIN

BULLETIN AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

BULLETIN AMERICAN CERAMIC SOCIETY

BUSINESS WEEK

BUTANE-PROPANE NEWS

CALIFORNIA OIL WORLD

CANADIAN CHEMISTRY AND PROCESS INDUSTRIES

CANADIAN JOURNAL OF RESEARCH: SECTIONS A AND B.

CERAMIC ABSTRACTS

CHEMICAL ABSTRACTS

CHEMICAL AND ENGINEERING NEWS

CHEMICAL AND METALLURGICAL ENGINEERING

CHEMICAL INDUSTRIES

CHEMICAL PREVIEW

CHEMICAL REVIEWS

CHEMIKER ZEITUNG *(Microfilm)*

CHEMISTRY AND INDUSTRY

CHIMIE ET INDUSTRIE *(Microfilm)*

COKE AND SMOKELESS FUEL AGE

COLLIERY GUARDIAN

COMBUSTION

COMPRESSED AIR MAGAZINE

DIE CHEMIE

DOMESTIC COMMERCE

ELECTRONIC INDUSTRIES

ENGINEERING AND MINING JOURNAL

ENGINEERS' DIGEST

FEUERUNGSTECHNIK *(Microfilm)*

FORTUNE

FUEL IN SCIENCE AND PRACTICE

GAS

GAS AGE

GAS AND OIL POWER

GAS APPLIANCE MERCHANDISING

GAS JOURNAL

GAS NEWS

GAS TIMES

GAS- UND WASSERFACH *(Microfilm)*

GAS WORLD

GENERAL ELECTRIC REVIEW

GREAT BRITAIN FUEL RESEARCH INTELLIGENCE STATION ABSTRACTS

HEATING AND VENTILATING

INDUSTRIAL AND ENGINEERING CHEMISTRY: ANALYTICAL EDITION

INDUSTRIAL AND ENGINEERING CHEMISTRY: INDUSTRIAL EDITION

INDUSTRIAL BULLETIN OF ARTHUR D. LITTLE, INC.

INDUSTRIAL GAS

INDUSTRIAL HEATING

INSTITUTION OF GAS ENGINEERS: BULLETINS, COMMUNICATIONS AND TRANSACTIONS

INSTRUMENTS

IRON AGE

JOURNAL OF THE AMERICAN CERAMIC SOCIETY

JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

JOURNAL OF APPLIED MECHANICS

JOURNAL OF APPLIED PHYSICS

JOURNAL OF CHEMICAL EDUCATION

JOURNAL OF CHEMICAL PHYSICS

JOURNAL OF CHEMICAL SOCIETY (LONDON)

JOURNAL OF THE INSTITUTE OF FUEL

JOURNAL OF THE INSTITUTE OF PETROLEUM

JOURNAL OF ORGANIC CHEMISTRY

JOURNAL OF PHYSICAL CHEMISTRY

JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS

JOURNAL OF THE SOCIETY OF CHEMICAL INDUSTRY

LP GAS

MATERIALS AND METHODS (METALS AND ALLOYS)

MECHANICAL ENGINEERING

MINING AND METALLURGY

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MONTHLY NATURAL GASOLINE REPORT

MONTHLY SUMMARY OF GAS COMPANY STATISTICS

NATIONAL GAS BULLETIN OF AUSTRALIA

NATIONAL PETROLEUM NEWS

NATURE

OEL UND KOHLE

OFFICIAL GAZETTE OF THE U.S. PATENT OFFICE

OIL AND GAS JOURNAL

OIL, PAINT AND DRUG REPORTER

OIL WEEKLY

PETROLEUM

PETROLEUM ENGINEER

PETROLEUM REFINER

PETROLEUM TECHNOLOGY

POWER

POWER PLANT ENGINEERING

PUBLIC UTILITIES FORTNIGHTLY

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ROCKETS

SCIENCE

SCIENCE ABSTRACTS: SECTIONS A AND B

SCIENTIFIC AMERICAN

SOUTHERN POWER AND INDUSTRY

STEEL

TECHNICAL NEWS BULLETIN OF THE NATIONAL BUREAU OF STANDARDS

PERIODICALS ABSTRACTED FOR GAS ABSTRACTS (CONT'D)

TRANSACTIONS AMERICAN INSTITUTE OF CHEMICAL ENGINEERS
TRANSACTIONS AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
TRANSACTIONS AMERICAN SOCIETY OF MECHANICAL ENGINEERS
TRANSACTIONS ELECTROCHEMICAL SOCIETY
U.S. BUREAU OF MINES BULLETINS, INFORMATION CIRCULARS, REPORTS OF INVESTIGATIONS AND TECHNICAL PAPERS
WEEKLY ANTHRACITE COKE REPORT
WOODALL-DUCKHAM TECHNICAL PRESS REVIEW
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ZEITSCHRIFT FÜR ANALYTISCHE CHEMIE *(Microfilm)*
ZEITSCHRIFT FÜR ANORGANISCHE CHEMIE *(Microfilm)*
ZEITSCHRIFT FÜR PHYSIKALISCHE CHEMIE *(Microfilm)*